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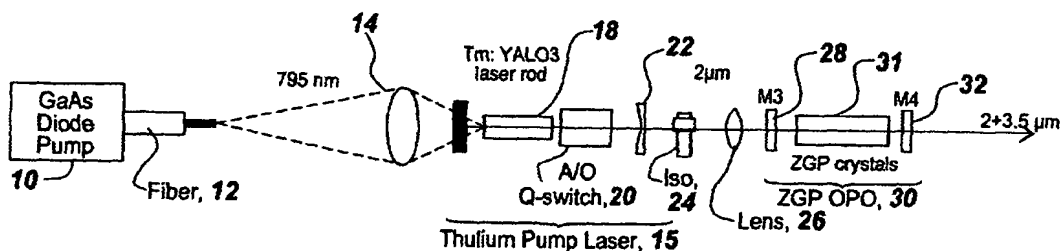
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(54) Title: THULIUM LASER PUMPED MID-IR SOURCE WITH BROADBANDED OUTPUT



(57) Abstract: A Thulium laser (15) is used to directly drive a  $\text{ZnGeP}_2$  optical parametric oscillator (30) with a nominal 2  $\mu\text{m}$  output to generate the 3-5 micron wavelengths. In one embodiment, the ZGP OPO is configured as a linear resonator and in another embodiment the ZGP OPO is configured as a ring resonator. The ring resonator prevents optical feedback to the Thulium laser (15) and eliminates the need for an optical isolator (24). Moreover, the Thulium laser pump (15) is implemented as a Tm:YAlO<sub>3</sub> laser repetitively Q-switched at 10 kHz is used to drive a  $\text{ZnGeP}_2$  OPO. The system is run with room temperature components and achieves over 3 W at 3-5 microns with an efficiency of 5% starting from the pump diode. A two crystal resonator (40, 42) design allows tuning over multiple spectral peaks or alternately as an ultra broad spectral source.

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